

Deposition of AlTiN Thin Films onto Additive Manufactured Parts in Ti6Al4V Alloy

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Abstract

In the present work, AlTiN thin film deposition process was carried out via reactive Physical Vapor Deposition High-Power Impulse Magnetron Sputtering (PVD HiPIMS) to coat Ti6Al4V substrates, realized via Selective Laser Melting (SLM).

Two different SLM process conditions were employed for modifying the obtained part surface morphology and, later, the samples were heat treated under high vacuum at 950°C for 1 hour.

The conditions of PVD HiPIMS deposition process were adjusted in order to optimize the matching between the metallic substrate and the ceramic coating. The structure, the composition, and the mechanical features of thin films were investigated by X-ray Diffraction, Energy Dispersive Spectroscopy associated to Field Emission Scanning Electron Microscopy (FE-SEM), and nanoindentation, respectively. Finally, FE-SEM was also employed for evaluating microstructure evolution of both substrates and thin films.

Keywords

Selective laser melting; Ti6Al4V; thin films; vacuum heat treatment; microstructure, High-Power Impulse Magnetron Sputtering, AlTiN.